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The determinants of Home based long-term care utilisation in Western European Countries

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Abstract

The need for long-term care (LTC) is projected to increase in all European countries due to the ageing of the population. The number of people aged 65 and older will double in EU-15 countries by 2050 under a pure ageing scenario and will increase by more than 30 per cent under the constant disability scenario.

The aim of this paper is to see how different individual characteristics and the LTC systems around Western Europe influence the utilisation of formal LTC (in terms of frequency of services received). The data used from this study come from the Survey of Health Ageing and Retirement in Europe (SHARE) 2004-2005. We test here the individuals and systems characteristics determining the influence of use professional home-based LTC service (nursing care, domestic home assistance and meals-on-wheals). The frequencies are modelled using a negative binomial regression model.

Our findings indicate that utilisation of professional home-based LTC increases significantly with factors like age, education, income and ADL (Activities of Daily Living) score. We found that the utilisation of LTC services is closely linked to the policy priorities, the financing and the organisations of the LTC system. In countries like the Netherlands, where a greater policy emphasis is put on home-based care, the utilisation of home-based LTC is higher compared with most of the other countries in the study.

Keywords: Long-term care, population ageing, negative binomial regression model

JEL Codes: I18, H51, I11

I. Introduction

The need for long term care (LTC) is projected to increase in all European countries due to the ageing of the population. The number of people aged 65 and older will double in both EU-15 and EU-10 countries by 2050 under a pure ageing scenario and will increase by more than 30 per cent under the constant disability scenario (DG ECFIN, 2006). Based on these scenarios public spending on LTC alone is projected to increase by 1% of GDP of these countries between 2004 and 2050 (DG ECFIN, 2006). LTC is generally defined as the "assistance to persons who are unable to live autonomously and are therefore dependent on the help of others in their everyday lives" (EPSCO and ECOFIN, 2003). Such assistance is often related to "help with facilitating mobility, shopping, preparing meals and other household tasks (like washing and feeding in the most extreme cases)".

LTC in Europe has been often underlined as a public responsibility and meant to increase the welfare by facilitating the activities of daily living (ALOSS, 2005; Scanlon, 1992). Due to its nature LTC is generally conceived as a mix of health and social care (Courbagea & Roudaut, 2008). For this reason it can be provided either in institutional settings (e.g. hospitals or care institutions) or in community and home-based settings. Similarly, the provision of LTC can be delivered either by professionals (medical staff or trained nurses) or non-professionals (family members or other relatives).

An often used approach to analyse the utilisation of LTC has been the behavioural model developed by Andersen (1995). According to this model, the utilisation depends on demographic factors, social structure status and health beliefs. In fact, various studies have shown that the growth in care expenditures can be attributed to the main demographic driver that is the population ageing (Yang et al., 2003; Pezzin et al., 1996; Comas-Herrera et al., 2007; OECD, 2006; Bech et al., 2011; Meijer et al., 2011). Ageing is clearly associated with higher morbidity, higher disability rates and intensive care events which translate to higher utilisation and expenditures for institution-based care, pharmaceuticals or nursing care (Heinrich et al., 2010). However, many studies have shown that the effect of ageing is often not the best predictor for LTC expenditures or

utilisation (Zweifel et al., 1999; McGrail et al., 2000; Meijer et al., 2011). Disability or time-to-death may be better predictors of LTC utilisation and expenditures (Payne et al., 2007). Elderly people tend to utilise LTC much more in the last years of life or when limited by disabilities.

A common approach to analyse LTC utilisation or expenditures is to differentiate between home and institutional care (nursing homes). A number of studies comparing LTC in home and nursing homes have concluded that factors contributing to the demand for more institutional care (i.e. nursing homes) or home care may be different (Finlayson, 2002; Kim et al., 2005). The main factors that determine the increased use of home care are: being married, poor physical functions, and impaired cognitive functions. On the other side, factors that determine the increased use of institutionalised care are; lack of spouses, bereavement, income, etc. Meijer et al. (2011) found that in the Netherlands age, sex, living alone, psychological problems, and hospitalisations have a large impact on formal LTC utilisation.

Many studies have looked at the effect of substitution between different forms of care. Kemper (1992) finds that an increase in income decreases the amount of informal care (unpaid family members care) utilised and increases the formal care. Other studies conclude that informal care potentially substitutes for homecare and generally postpones LTC admissions (Van Houtven & Norton, 2004; Bonsang, 2009). Yet, some of the issues are still debatable about the determinants of the utilisation of formal LTC. How do individuals with similar characteristics choose between different forms of formal LTC? Is this choice (and the utilisation frequencies) based on how the LTC systems are financed and structured in different European countries? Are different forms of LTC complements or substitutes to each-other?

If we look at the budget spending for LTC during the years, we can say that these reflect to a certain extent the country-specific philosophy towards the provision of LTC. For example OECD data for 2007- 2008 (OECD, 2011) show that the total per capita expenditure on LTC in Scandinavian countries like Sweden and Denmark - where the

model is based on state responsibility (CESEP, 2007) – was respectively 1332 USD and 724 USD, PPP. This was much higher that in Mediterranean countries like Spain (271 USD, PPP) – where the family has more responsibilities in providing LTC. Similarly, Mediterranean countries like Italy and Spain are also among the countries characterised by the highest share of informal care givers among OECD countries (OECD, 2011). The philosophy of 'family responsibility' is also reflected in the other Central European countries (Riedel & Kraus, 2010) even though there is a greater variability as the families here may take fewer responsibilities because the role of the state is higher than in the Mediterranean countries. For instance, in Austria the LTC per capita is 367 USD (PPP), three times lowers if compared to the Netherlands (1421 USD PPP) and two times lower than in Belgium (707 USD PPP) (OECD, 2011).

We consider the incidence of professional LTC at home. More specifically we differentiate between home-based nursing care, domestic home assistance and meals-on-wheals. We use data for 9 European countries: Austria, Belgium, Denmark, France, Germany, Italy, Netherlands, Spain and Sweden, as the information on home-based care for Greece and Switzerland is not available. The data come from the first wave of Survey of Health Ageing and Retirement in Europe (SHARE). SHARE is a cross-national survey on health, social and economic aspects of people 50 and more years old. The survey was designed as a panel. The first wave of the survey was implemented in 2004 and included 11 countries (Denmark, Austria, Belgium, France, Germany, Greece, Italy, Netherlands, Spain, Sweden and Switzerland), Israel joined in 2005-2006, and three more countries (Czech Republic, Ireland and Poland) participated in the second wave in 2006-2007.

The main aim of this study is to see explore the determinants of professional home-based LTC utilisation systems across Western European countries. In more details we check for the particular role of individual and household characteristics as well as the country-specific role in utilisation of the LTC system for three main types of home-based services (nursing care, domestic home assistance and meals-on-wheals). The main motivation behind this study is to add to the existing literature, which is primarily focused

on analysing the substitution effects between informal and formal LTC services, as well as bring a new comparative perspective of the utilisation for LTC.

For the purpose of this study, we have selected only those individuals of 65 years or older who have answered the questions on the need for professional long term care at home, specifically on nursing care; domestic home assistance for tasks that you could not perform yourself due to health problems, and meals-on-wheels. To identify the country effects we have pooled the data for the 9 selected countries and have assigned a dummy variable for each of them.

II. Methods

The incidence of receiving professional LTC home-based is modelled using a probit model which distinguishes how patients and systems characteristics influence the use of nursing care, domestic home assistance and meals-on-wheals. The probability of services received can be considered as dependent on characteristics of the individual and the specific set-up of the LTC system in the country. The control variables include age, gender, marital status, education, income, number of children and siblings, received informal help from outside the household, basic activities of daily living (ADLs are self-care activities that a person must perform every day such as bathing, dressing, eating, getting in and out of bed or a chair, moving around, using the toilet, and controlling bladder and bowel functions), instrumental activities of daily living (IADLs are activities related to independent living and include preparing meals, managing money, shopping for groceries or personal items, performing light or heavy housework, and using a telephone.), chronic or long-term health problems, self perceived health European version (‘0’good or very good health & ‘1’ less than good health), as well as the dummy variables identifying each country.

The determinants of frequency of service use are tested using frequency of care (in weeks per year) in three main settings: nursing care, domestic home assistance and meals-on-wheals. As the frequency of receiving LTC occurs within a defined limit of time (within one year), and the probabilities of receiving professional LTC are not

dependent on each other, we assume that the distribution of receiving's frequencies follows a Poisson distribution similar to count data. Consequently, the count rate would be calculated as:

$$\mu_i = E(y_i) = \exp(x_i\beta) \qquad (1)$$

where, μ_i is the expected frequency which depends on a vector of determinants of LTC, β represents the vector of estimated coefficients for each determinant of LTC frequency, and x_i includes the determinants of receiving professional LTC at home. The Poisson probability of a specific count is therefore expressed as:

$$\Pr(Y_i = y_i) = \frac{e^{-\mu_i}\mu_i^{y_i}}{y_i!}, \quad y = 1,2,3,...n \qquad (2)$$

where, for the i^{th} count, y_i is the count.

However, the Poisson model does not well fit our data. Our data show over-dispersion (i.e., variance is greater than the mean). In order to correct for this over-dispersion in the frequency of receiving professional LTC in home-based we choose to use the "negative binomial regression model" (NBRM). The NBRM accounts for heterogeneity among count outcomes (Greene, 1994). The predicted count probability in a NBRM is given as:

$$\Pr(Y = y_i) = \frac{\Gamma(y_i + \phi)}{\Gamma(\phi)y_i!}\left(\frac{\phi}{\mu_i + \phi}\right)^{\phi}\left(\frac{\mu}{\mu_i + \phi}\right)^{y_i}, \; y = 1,2,3,...n \qquad (3)$$

where, the variance in the predicted counts is increased through a parameter accounting for the suspected (over)dispersion (see also Long & Freese, 2001). In order to check how different variables change based on severity of the services we estimate NBRM models separately for nursing care, domestic home assistance and meals-on-wheals.

III. Results

The data showed a great variability in terms of disabilities as well as incidence and utilisation of LTC between the countries selected for the analysis.

Table 1. Descriptive statistics for individuals that received professional LTC at home-based

Country	Age of the patient	Number of limitations with activities of daily living (ADLs)[1]	Number of limitations with instrumental activities of daily living (IADLs)[2]	Chronic or long-term health problems	Self perceived health (European version)[3]
Austria	79.716	1.200	2.347***	1.758	2.537***
	(7.187)	(1.661)	(1.872)	(1.576)	(0.965)
Germany	81.137***	1.384**	2.055	1.274***	2.384***
	(7.194)	(1.705)	(2.020)	(1.017)	(0.907)
Sweden	82.737***	1.146	2.080*	1.934	2.890
	(7.344)	(1.734)	(2.223)	(1.699)	(0.979)
Netherlands	78.171	0.641***	1.177***	2.348***	3.133***
	(7.004)	(1.215)	(1.589)	(1.896)	(0.812)
Spain	79.263	1.729***	2.526***	1.571**	2.526***
	(7.754)	(2.129)	(2.690)	(1.405)	(0.997)
Italy	77.383	1.800***	2.633***	1.933	2.433***
	(8.207)	(2.192)	(2.642)	(1.706)	(0.810)
France	78.185*	0.835**	1.603	1.882	2.965
	(7.605)	(1.383)	(1.968)	(1.661)	(0.905)
Denmark	79.993*	0.735**	1.565	1.816	3.095**
	(7.040)	(1.391)	(1.676)	(1.618)	(0.917)
Belgium	77.503***	0.906	1.536**	2.066**	3.173***
	(6.999)	(1.442)	(1.933)	(1.771)	(0.922)
Total	78.874	1.010	1.760	1.921	2.931
	(7.452)	(1.591)	(2.055)	(1.684)	(0.951)

Note: Stars indicate if the mean for the particular country is significantly different from the mean of all other countries (*** p<0.01, ** p<0.05, * p<0.1). Standard deviations are in parentheses.
1. ADLs: Activities of Daily Living are self-care activities that a person must perform every day such as bathing, dressing, eating, getting in and out of bed or a chair, moving around, using the toilet, and controlling bladder and bowel functions. 2. IADLs: Instrumental activities of daily living are activities related to independent living and include preparing meals, managing money, shopping for groceries or personal items, performing light or heavy housework, and using a telephone. 3. This variable dichotomises the European version of self-perceived health into two categories: (0) good or very good health & (1) less than good health.

Table 1 gives detailed information on the age, ADLs, number of limitations with instrumental activities of daily living (IADLs), chronic or long-term health problems and self perceived health (European version) for individuals that are receiving professional LTC services at home. The results show that the severity of disabilities differs between the people that received care at home. The two columns giving ADLs and IADLs scores show that Mediterranean countries like Spain and Italy give home care to the most

severed disabled people (based on both scales) compared to the other countries. On the other hand in countries like the Netherlands, France, Denmark and Belgium individuals who received professional LTC at home have fewer disabilities compared with other European countries. These facts can be explained by the 'generosity' of the LTC system as well as the higher reliance on family informal care in Mediterranean countries. The table shows that countries like the Netherlands, and Belgium had the highest chronic or long-term health problems (differences showed to be statistically significant). Self perceived health was lower for individuals receiving home-based LTC in Spain and Italy if compared with individuals in other countries.

Table 2. Descriptive statistics for the incidence and the frequency of receiving LTC for people 65+

	Nursing care[1]		Domestic home assistance[2]		Meals-on-wheels[3]	
Country	**Incidence**	**Frequency**	**Incidence**	**Frequency**	**Incidence**	**Frequency**
Austria	0.046***	36.366***	0.050***	33.841	0.034*	36.067
	(0.210)	(19.873)	(0.218)	(19.504)	(0.181)	(18.291)
Germany	0.022***	30.517**	0.025***	32.545	0.024	30.188**
	(0.147)	(21.538)	(0.156)	(20.137)	(0.154)	(20.422)
Sweden	0.018***	21.958	0.082	31.321***	0.027	42.595*
	(0.133)	(21.519)	(0.274)	(19.670)	(0.161)	(18.292)
Netherlands	0.040***	28.957***	0.139***	38.401	0.025	35.571
	(0.197)	(21.235)	(0.346)	(16.704)	(0.155)	(21.459)
Spain	0.055*	10.806***	0.059***	33.000*	0.002***	6.500**
	(0.228)	(16.236)	(0.236)	(20.066)	(0.040)	(7.778)
Italy	0.024***	16.667	0.034***	34.421	-	-
	(0.154)	(18.204)	(0.181)	(20.389)	-	-
France	0.181***	14.463***	0.123***	41.173***	0.025	38.212
	(0.386)	(19.072)	(0.329)	(17.482)	(0.155)	(19.591)
Denmark	0.069	27.200**	0.188***	32.240***	0.065***	44.791***
	(0.254)	(22.063)	(0.391)	(18.512)	(0.246)	(15.187)
Belgium	0.124***	23.515**	0.156***	38.866**	0.036***	35.000
	(0.330)	(22.453)	(0.363)	(17.291)	(0.187)	(20.553)
Total	0.068	20.610	0.093	36.475	0.025	37.443
	(0.251)	(21.454)	(0.291)	(18.467)	(0.155)	(19.603)

Note: Stars indicate if the mean for the particular country is significantly different from the mean of all other countries (*** p<0.01, ** p<0.05, * p<0.1). Standard deviations are in parentheses.
1. Professional or paid nursing or personal care. 2. Professional or paid home help, for domestic tasks that you could not perform yourself due to health problems. 3. Meals-on-wheels

Table 2 gives information on the share of people 65 years or older receiving professional LTC services and on the frequency of services received for different countries. The meals-on-wheals service is especially less frequent in Mediterranean countries and information on such service is not provided for Italy. The most widespread service within countries is the domestic home assistance while meals-on-wheels is the

least frequent used one. France and Belgium are among the countries with a higher incidence of almost all home care services (results for the incidence of nursing care, domestic home assistance and meals-on-wheels are always statistically significant for these countries). The frequency of domestic home assistance is much higher compared to the frequency of receiving nurse care. This can be related to the fact than whenever individuals receive professional nursing care for a long time the service will be shifted to institutional care.

The results of models for the incidence of receiving professional LTC at home are presented in Table 3. All estimations are presented as odds ratios (OR).

Table 3. The incidence of receiving LTC - (Odds Ratios)

	Nursing care[1]		**Domestic home assistance** [2]		**Meals-on-wheels**[3]	
	Odds ratio	se	Odds ratio	se	Odds ratio	se
Age of the patient	0.910	(0.092)	1.528***	(0.148)	1.733***	(0.289)
Age square	1.001	(0.001)	0.998***	(0.001)	0.997***	(0.001)
Reference gender – male						
Gender female	1.292***	(0.128)	1.909***	(0.173)	0.648***	(0.100)
Reference marital status – single						
Marital status - married, partnership	0.964	(0.109)	0.528***	(0.054)	0.359***	(0.071)
Reference education - pre-primary, primary and lower secondary education						
Secondary education	1.044	(0.128)	1.025	(0.113)	1.135	(0.204)
High education	1.014	(0.148)	1.150	(0.143)	1.137	(0.245)
Ln income per capita	1.062	(0.053)	1.084*	(0.052)	1.049	(0.088)
Number of children	1.023	(0.027)	0.944**	(0.023)	0.905**	(0.040)
Receiving help from outside household	1.803***	(0.185)	2.021***	(0.177)	1.981***	(0.303)
Number of limitations with activities of daily living (ADLs)	1.385***	(0.058)	1.063	(0.043)	0.943	(0.060)
Number of limitations with instrumental activities of daily living (IADLs)	1.218***	(0.041)	1.247***	(0.038)	1.396***	(0.066)
Chronic or long-term health problems	0.875***	(0.025)	0.889***	(0.021)	1.040	(0.044)
Self perceived health (European version)	0.696***	(0.039)	0.670***	(0.034)	0.672***	(0.057)
Country The Netherlands						
Austria	0.716	(0.170)	0.128***	(0.026)	0.792	(0.231)
Germany	0.294***	(0.075)	0.068***	(0.015)	0.763	(0.219)
Sweden	0.241***	(0.069)	0.279***	(0.050)	0.748	(0.241)
Spain	0.566**	(0.126)	0.138***	(0.025)	0.027***	(0.020)
Italy	0.249***	(0.068)	0.098***	(0.021)		
France	4.148***	(0.728)	0.418***	(0.058)	0.498***	(0.142)

Denmark	1.185	(0.290)	0.808	(0.141)	1.849***	(0.566)
Belgium	2.879***	(0.512)	0.852	(0.108)	1.114	(0.280)
Number of observations	10853		10853		9697	
Pseudo R2	0.2791		0.3034		0.2767	

Note: *** p<0.01, ** p<0.05, * p<0.1. Standard errors and reference categories are in brackets.
1. Professional or paid nursing or personal care. 2. Professional or paid home help, for domestic tasks that you could not perform yourself due to health problems. 3. Meals-on-wheels

Our findings indicate that the probability of receiving professional long-term care at home-based varies across patients' groups and between countries. Elderly patients have a higher probability of receiving professional long-term care at home-based, except for the case of nursing care. The odds of receiving professional domestic home assistance increase by 1.528 and for meal-on-wheal service, the odds increase by 1.733 for each year of getting older.

Female patients are more likely to receive professional nursing care (OR=1.292) and domestic home assistance (OR=1.909) compared to males, while for meals-on-wheal services they are less likely (OR=0.648). Individuals in marriage or partnership are less likely to use professional home-based LTC compared to widowed, divorced or single individuals (ORs for nurse care, domestic help and meal-on-wheals are 0.964, 0.528 and 0.359 respectively). Results show also that higher educated individuals have a higher probability of using professional LTC home-based services compared to lower educated individuals, but none of the coefficients are statistically significant. The education categories here follow the same division used by SHARE where the division is standardized based on of the ISCED (international standard classification of education) (UNESCO 1997) and divided in three main groups: levels 0-2 (pre-primary, primary and lower secondary education), 3 (upper secondary education) and 4-6 (post-secondary education). On the other hand individuals with a higher income have a higher probability to receive professional home-based LTC services, though only domestic home assistance is statistically significant (OR=1.08). This can be due to the fact that they are more willing to pay for these services.

The number of children seems to influence the probability of receiving LTC only for domestic home assistance and meals-on-wheals service while it is negatively related to the probability of receiving these services (ORs 0.944 and 0.905 respectively). The probability of getting professional LTC home-based seems to be closely related to the household situation. In fact, the results show that people receiving help from outside the household have a higher odds of receiving nurse care (OR=1.803), domestic home assistance (OR=2.021) and meals-on-wheals (OR=1.981) than people who do not receive help.

Our results show that receiving professional LTC home-based also depends on the difficulties that people 65 years or older have with their daily activities (ADLs and IADLs). In fact, people showing difficulties with instrumental activities have 1.218; 1.247 and 1.396 times higher odds for receiving respectively nurse care, domestic home assistance and meals-on-wheals respectively. One exception is individuals showing difficulties with daily living: they receive less meals-on-wheals service (OR=0.943) though the result is not statistically significant.

Results on the differences between the countries show that people living in countries like Austria, Germany, Sweden, Spain and Italy have lower odds of receiving home-based professional nurse care than people living in the Netherlands (the reference category). France and Belgium seem to be the countries where people have the highest odds of receiving home-based nurse care (ORs were 4.148 and 2.879 higher than in the Netherlands). On the other hand people living in the Netherlands have higher odds of receiving professional domestic home assistance compared to all other countries in the study. Among all countries France and Belgium seem the countries where people 65 or older have higher odds of receiving meals-on-wheals (OR=1.849 and OR=1.114 respectively) than in the Netherlands.

The results of models estimating the frequencies (in terms of weeks per year) of receiving professional long term care services home-based LTC services are given in

Table 4. The models are estimated separately for individuals receiving professional nurse care, domestic home assistance and meals-on-wheals.

Table 4. The frequency of receiving LTC - Negative binominal regression

	Nursing care[1]		**Domestic home assistance [2]**		**Meals-on-wheels[3]**	
	coef	se	coef	se	coef	se
Age of the patient	0.040	(0.089)	0.008	(0.054)	0.110	(0.113)
Age square	-0.000	(0.001)	-0.000	(0.000)	-0.001	(0.001)
Reference gender – male						
Gender female	0.003	(0.095)	-0.054	(0.052)	-0.268**	(0.105)
Reference marital status – single						
Marital status - married, partnership	-0.204*	(0.112)	-0.072	(0.059)	-0.129	(0.142)
Reference education - pre-primary, primary and lower secondary education						
Secondary education	-0.267**	(0.116)	0.023	(0.065)	-0.020	(0.125)
High education	-0.011	(0.144)	0.043	(0.073)	0.056	(0.149)
Ln income per capita	0.067	(0.052)	-0.006	(0.028)	0.078	(0.059)
Number of children	-0.016	(0.023)	-0.007	(0.013)	-0.018	(0.030)
Receiving help from outside household	-0.082	(0.094)	0.024	(0.050)	-0.062	(0.106)
Number of limitations with activities of daily living (ADLs)	0.056*	(0.034)	0.004	(0.020)	0.018	(0.040)
Number of limitations with instrumental activities of daily living (IADLs)	0.116***	(0.028)	0.041***	(0.016)	0.074**	(0.031)
Chronic or long-term health problems	-0.038	(0.029)	-0.009	(0.014)	0.010	(0.030)
Self perceived health (European version)	-0.121**	(0.054)	0.019	(0.028)	0.070	(0.059)
Country The Netherlands						
Austria	0.139	(0.227)	-0.218*	(0.123)	0.086	(0.203)
Germany	-0.171	(0.254)	-0.262*	(0.138)	-0.003	(0.203)
Sweden	-0.705**	(0.283)	-0.292***	(0.103)	0.022	(0.218)
Spain	-1.307***	(0.215)	-0.202**	(0.101)	-1.828***	(0.632)
Italy	-0.781***	(0.268)	-0.156	(0.128)		
France	-0.680***	(0.169)	-0.014	(0.079)	0.042	(0.198)
Denmark	-0.294	(0.238)	-0.214**	(0.097)	0.135	(0.204)
Belgium	-0.170	(0.172)	-0.018	(0.071)	0.039	(0.175)
_cons	0.606	(3.560)	3.120	(2.189)	-2.577	(4.634)
/lnalpha	0.054	(0.051)	-0.817***	(0.048)	-0.750***	(0.093)
Number of observations	726		1001		264	

Note: *** p<0.01, ** p<0.05, * p<0.1. Standard errors and reference categories are in brackets.
1. Professional or paid nursing or personal care. 2. Professional or paid home help, for domestic tasks that you could not perform yourself due to health problems. 3. Meals-on-wheels

The results show that age positively affects the frequency of receiving professional LTC as nursing care, domestic home assistance and meals-on-wheals services. Individuals seem to need more weeks of care as they grow older (though the coefficients are not statistically significant).

Despite the fact that women have a higher probability of receiving professional LTC at home the frequency of receiving these services is lower than for men (except for nursing care at home). Similarly to the probability of receiving LTC, being in a couple (being married or in partnership) has a negative effect on the amount of weeks LTC is received for all services offered compared to being single. The weeks of professional LTC received for married individuals decreased by 0.204 for nursing care while for the two other services, domestic home assistance and meals-on-wheals, the coefficients are not statistically significant.

The level of education seems not to be significant and the results are quite mixed between different services and different levels of education. The only coefficient that is statistically significant is for individuals that have secondary education and receive nursing care at home. These individuals seem to receive 0.267 less professional nursing care services compared with individuals to primary education.

Variables like number of siblings and help from the outside household has a negative effect on the number of weeks receiving professional home-based LTC services (though both effects are not statistically significant), except for the domestic home assistance where help from outside household has a positive effect on the frequency of weeks receiving LTC.

As expected the number of weeks receiving professional LTC goes in the same direction with the severity in coping with difficulties in daily living activities (ADLs and IADLs). The severity of ADLs increases the frequency of nurse care services receives with 0.056 weeks while results for domestic home assistance and meals-on-wheals are not statistically significant. A higher IADLs score increases the frequency of receiving

nursing care with 0.116 weeks, while for domestic home assistance and meals-on-wheals the frequency is increased by 0.041 and 0.074 weeks respectively.

The effect of health scores on the frequency of receiving professional LTC at home is quite mixed. The results show that individuals with chronic or long-term health problems and individuals with lower self perceived health seem to receive less frequently professional nursing care (for instance individuals with lower self perceived health seem to receive 0.121 weeks less compared with individuals with higher self perceived health). The frequency of receiving domestic home assistance services is negatively correlated with having chronic or long-term health problems and positively correlated with lower self perceived health (even though both effects are not statistically significant). At the same time, the frequency of receiving meals-on-wheels services is positively correlated with higher health problems but in both cases coefficients are not statistically significant.

On the country-level the results show that the Dutch system for home-based professional LTC services is quite 'generous' compared to all other 8 European countries. Individuals 65 years or older living in the Netherlands receive more frequently professional nursing care than in all other countries, (except for Austria). The frequencies of receiving professional nursing care are particular lower in Spain and Italy where individuals 65 years or older receive 1.307 and 0.781 fewer weeks respectively compared to the Netherlands. The situation is similar for domestic home assistance. The frequencies of receiving meals-on-wheals services are particular lower in Germany and Spain compared with the Netherlands (0.003 and 1.828 fewer weeks received).

IV. Discussion

Understanding the current demand for professional home-based LTC services is important to predict future trends and identify potential efficiency improvements. We argue here that the types of LTC care chosen and the duration of care episodes depend on two main factors: a set of individual characteristics (determining the demand for professional home-based LTC services) and the availability and 'generosity' of the formal care offered (which varies between European countries).

Our results show that the utilisation of home-based professional LTC increases significantly with factors like age and difficulties with daily life activities (ADLs and IADLs). This is in line with the findings of other studies (Scheiber & Poullier, 1987; Broome´ et al., 1994, OECD, 2006; Comas-Herrera et al., 2007; Bolin et al., 2008) sustaining that old-age and (the resulting) disabilities increase the need for both home and institution-based LTC. In fact, as 'ageing' is even defined as "the progressive loss of daily function" (Kirkwood & Austad 2000) it will inevitably increase the demand for LTC.

Very often the effect that the supply for LTC services has on conditioning the demand for LTC is underestimated by empirical studies. This in turn gives a partial picture on present and future situation of the LTC services. The cross-country approach has shown here that the 'generosity' of the offered services can positively influence the demand for LTC and the frequency of receiving professional home-based care.

Our results also confirmed that the patterns of utilisation of professional home-based LTC differ between countries in Europe. In fact, if we assume that patients' characteristics and preferences are homogenous over countries then the differences in utilisation of home-based professional LTC services will probably be driven by the availability (and affordability) of professional LTC services (i.e. nursing care, domestic home assistance and meals-on-wheals services), as well as the informal care received from relatives. We show that countries differ in to the specific weight of these three professional home-based LTC services and this does not always depend on the model chosen ('state responsibility' versus 'family responsibility' models).

We show that France and Belgium are the countries where people have the highest odds of receiving professional nursing care and domestic home assistance. This is probably because of various reasons. The French LTC system is a mixed one built on Beveridge's and Bismark's models favouring family-based characteristics. However, LTC became a matter of national priority after the 15.000 deaths registered in 2003 as a

consequence of the heat wave (Joël et al., 2010). Belgium on the other hand has a wide spread LTC system which offers various services and is financed by taxes as well as social and health contribution. The system offers a universal coverage providing a wide range of home-based services (Willemé, 2010). This may have favoured the likelihood of getting home-based LTC services for different groups of the population.

On the other side this effect was to some extent offset by the coefficients showing the frequencies of transfers where people in France and Belgium are getting fewer weeks of care than people in the Netherlands (where both professional nursing care and domestic home assistance are received over a longer period than in other countries) This shows that a universal or easy accessed system can not afford to provide longer duration of services, and thus conditioning their frequency.

The incidence and the frequency of professional home-based LTC can be affected by the financing and organisation of these schemes. For example the LTC system of Southern European countries like Spain and Italy is generally characterised by a complex and fractionised financing and most of the LTC expenditures are paid directly by households. Households play also a much higher role in providing informal LTC care (Gutiérrez, 2010; Tediosi & Gabriele, 2010). In fact, the results on the incidence and frequencies for these two countries also show that despite the fact that the odds of receiving home-based care are not among the lowest, the weeks of receiving home-based nursing services are much lower than in any other country in the analysis.

The differences between countries are more evident especially looking at specific services like meals-on-wheals. These services are more frequent in countries like Denmark and Belgium followed by Austria, Germany and Sweden. On the other hand Italy is a country where this kind of service is not offered whereas in other Southern European countries like Spain (or even France) this service is very limited.

It is often argued that formal care is closely linked to the provision of informal care provided by relatives. This complex relationship was not analysed in details in this study.

However, our results show some interesting trends in this regard. We show that marriage or partnership can indeed substitute for all professional home-based LTC services offered (even though the effect is not always statistically significant). This can be mostly because couples are more likely to take care of each other (Bolin et al., 2008). Moreover this form of care is proved to postpone an admission to a LTC institution (Houtven & Norton, 2004; Bonsang 2009). On the other hand the help received from outside the household is found to be a complement for these kinds of services i.e., it is positively correlated with all professional home-based LTC services offered. This finding is similar to the findings of previous studies where informal care is a complement to physician and hospital visits (Bolin et al., 2008). The complementary effect may be due to the fact that the help from other relatives living outside of the household can only complement nursing care, domestic home assistance and meals-on-wheals services (e.g by providing extra care in certain regular or irregular intervals) without being able to completely substitute for them (as it is the case of the spouses). A similar effect is also seen when checking for the number of children against the incidence of receiving professional nursing care. Children living outside the household did not influence very much the likelihood of receiving professional nursing care but they can pay for this service. The situation is different for two other services: domestic home assistance and meals-on-wheals. In these later cases children did substitute for these services (probably because these services are less specialised).

The utilisation of LTC services is also closely linked to the policy priorities as well as the financing and organisations of LTC systems. For example we showed that in countries like the Netherlands – where a greater policy emphasis is put on home-based care (Mot, 2010) – the utilisation of home-based LTC is higher than in most other countries.

V. Conclusions

Countries all around Europe are facing challenges in order to provide sustainable, universal and comprehensive LTC service for an increasing number of older people in an ageing and declining population. As the demand for these services is increasing over the years the focus of the policy-makers has shifted from institution-based services to home-

based services. On the other hand the supply of informal care over the time is decreasing as this is mostly provided by spouses and children (Heitmueller, 2007). This study has looked at the determinants of demand for professional home-based LTC services offered at home from a cross-country perspective. Using household level data we were able to show that the utilisation of home-based professional LTC services depends not only on age and disability but also on specifics of services, the availability of spouses and help received from outside of the household as well as on country-specific availability of services and policies followed. We have also showed that there is clearly a case for undersupply of LTC in some countries and oversupply in others.

Future research should concentrate on identifying and measuring the demand for specific home-based professional LTC services and determining to whether there exists an undersupply or oversupply for these services in specific countries.

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Annex

Table A1. The financing of Long term care system in some of the Western European Countries

Country	The financing of Long Term Care service				Comments
	Tax-based	Public insurance	Private insurance	Out-of-pocket	
Austria	x	x		x	Funds managed by social insurance institutions.
Belgium	x	x		x	Social security contributions by workers, employers and retirees are not earmarked for the LTC[1]
Denmark	x			x	The costs of LTC are financed through local taxes and block grants from the state
France	x	x	x	x	The French LTC system is a mixed system based on Beveridge's and Bismark's models and with family-based characteristics.
Germany		x	x	x	LTC insurance is Germany is mandatory and universal and is introduced as a fifth pillar of the social security system[2]
Italy	x			x	The LTC system in Italy is characterised by a high level of institutional fragmentation, as sources of funding, governance and management responsibilities are spread over local (municipalities) and regional authorities, with different modalities in relation to the institutional models of each region.
The Netherland	x	x		x[3]	The Exceptional Medical Expenses Act (AWBZ) scheme is open-ended in nature: since it is public insurance, everyone who is eligible for long-term care is— in principle— entitled to receive care. Some form of income-dependent cost-sharing exists for practically all LTC services
Spain	x			x	Most of the services are provided by family (70%). A new organisational act (December 2006) aims in re-organising provision of LTC.
Sweden	x			x[4]	The management and planning of care for the elderly is split among three authorities – the central government, the county councils and the local authorities.

Note: 1. One notable exception is the Flemish long-term care insurance, which is financed by a specific contribution paid by every adult resident into a designated fund. 2. Members of the public health insurance system become members of the public long term care insurance (LTCI) scheme, and those who have private health insurance are obliged to buy private, mandatory LTCI providing the same benefit packages. 3. As co-payments are income-dependent, care users will not run into severe financial difficulties. 4. To avoid financial exploitation of the individual, a maximum monthly fee for long-term care (LTC) is set by the central government with further conditions imposed, depending on the financial situation of the individual.

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